Activity Patterns in Small Mammals. An Ecological Approach

Daan, Serge

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Röell has done a good job of summarizing and tracing these influences on the development of the field, though some readers may find his descriptions more detailed than necessary if they are not specifically interested in Dutch ethology. The material in the book might also have been organized somewhat differently as there is often considerable overlap among chapters. Nonetheless, the book as a whole presents a wealth of information that will be mostly new to English-speaking audiences, and will remain an indispensable source for those interested in the history of the field.

Halle, S. & **Stenseth**, N. C. 2000: Activity Patterns in Small Mammals. An Ecological Approach. Ecological Studies, Volume 141. Springer, Berlin, Heidelberg, New York. XXII + 320 pp., 59 figs, 11 tables, US$ 109.00, £65.00. ISBN 3-540-59244-X.

Reviewed by Serge Daan, Zoological Laboratory, University of Groningen. E-mail: s.daan@biol.rug.nl

Ethology is slowly recovering from the trauma it suffered in the 1970s when researchers interested in causation and function of behaviour decided to divorce. They founded the fields of Behavioral Ecology and Neuroethology, each with their own journals and their own societies. Only recently, behavioral ecologists have started to realize that their models require insight into the physiology and causation of decision making and, only recently, behavioral physiologists have started to acknowledge again that functional insight helps in the understanding of mechanisms in behaviour and cognition. From this perspective it seems counterproductive that the editors of this collection of essays are proposing to split off a new field, labeled 'Chronoecology', from animal behaviour research.

Chronobiology, focussing on the temporal organization of behaviour and not on either its function or causation, is one of the successful branches of our discipline. Its original black box approach led to the concept of circadian pacemakers in the brain and to models of how these control behaviour patterns. Such pacemakers were subsequently found in the CNS of many taxa, and the ethological models developed subserved their neurophysiological and now also molecular genetic analysis. In turn the physiological knowledge now allows experimental interference with behavioural patterns in the field, providing a crucial tool for studying the evolutionary significance of temporal organization, such as in the landmark studies of Patricia DeCoursey on ground squirrels. The concept of 'chronoecology', which implies that ecology can do once again without physiology, is the one weakness of this book. The editors appear to be insufficiently aware of the physiological basis of their topic. They write for instance that '… the basic feature of all clocks is a fluctuation in the melatonin titer with high levels at night-time and a decrease during the day. This hormonal rhythm is in one way or another translated into physiological and behavioural rhythms …' (p. 277). It is well known in the field that melatonin is neither required for nor involved in the generation of behavioural rhythms. The lack of physiological interest also led to the omission of a major area of research on the generation of mammalian activity patterns, viz. the study of the internal control of feeding behaviour that made great strides in understanding homeostatic benefits as well as internal signals involved in temporal organization.

Such omissions are not restricted to causal analysis. Two modern approaches to understanding the function of temporal organization are not mentioned in the book: theoretical analysis using dynamic programming and experimental analysis based on interference with activity patterns. What is missing most in a book on this highly interesting topic is a thorough theoretical framework for understanding the diversity of activity patterns. Behavioral ecology has developed optimization frameworks for foraging, life history, sex allocation. A similar framework is urgently needed for temporal organization. This is not an omission of the editors. Such a framework simply does not exist yet. Its development will most likely be a two-step process, in which first the time budget, then the periodicity is tackled. January Weiner, in one of the most attractive chapters in this book makes a first approach to the time budget problem. He attempts to relate the optimal fraction of time dedicated to foraging activity to rates of energy acquisition and assimilation. Unfortunately, this chapter is neither referred to nor used as a framework in the subsequent more descriptive chapters of the book.

Weiner's chapter on energetics and a valuable introduction to biological clocks by Timothy Bartness and Elliott Albers are the main introductory chapters. Ten chapters summarize the available information on carnivores (2), rodents (6), insectivores (1) and bats (1). Of these, I found the analysis of strategies employing daily torpor in Djungarian hamsters by Thomas Ruf and Gerhard Heldmaier (chapter 12) the most compelling and thought-provoking. Halle's own studies on vole activity patterns, summarized in chapter 11, yielded among the most impressive data on populations in a (semi)natural setting, but have been extensively published before.

Together, these 10 chapters provide a valuable reference source to what is known on the topic, and a handy compilation for mammalian researchers who can afford it. The price seems prohibitive for personal use in spite of the low-quality paper, and the book is likely to end up on a few institutional library shelves. A book such as this can be produced today for one-tenth of the price with standard desk-top publishing software and a local printer, and could easily be marketed by the editor on a nonprofit basis to his colleagues in the field. It is regrettable that for the publication of such volumes scientists still team up with publishers aiming for small sales and high retail price.

Griffin, D. R. 2001: Animal Minds: Beyond Cognition to Consciousness. University of Chicago Press, Chicago. 355 pp., 0 figs, 0 tables, Hb $27.50, £17.50, ISBN 0-226-30865-0.

Reviewed by Robert R. Hampton, Laboratory of Neuropsychology, NIMH. E-mail: robert@ln.nimh.nih.gov

Griffin's revised book is an impressive, informative and readable survey of evidence for complex and flexible animal cognition garnered primarily from ethological studies. Students of animal cognition whose work is concentrated in the laboratory will enjoy the rich accounts of behavior in natural settings, and many field workers reading the book will learn new details of familiar behaviors. The book encourages us to strive even harder to expand verifiably the boundaries of animal cognition, but many will find that the facts presented fall predictably short of compelling the thesis expressed in the title.

Griffin's evocative prose makes up for the lack of figures. Particularly enjoyable are accounts of the interactions of lions and gazelle, beaver dam building and maintenance, and the construction of the glorious bowerbird bowers. A recurrent topic is the behavior of invertebrates, through which Griffin convincingly argues that these animals are capable of complex information processing. Less convincingly, he also suggests that they may be conscious of the information they process.

As indicated by the title, arguments are made for the importance and feasibility of the study of consciousness in nonhuman animals. Scientists studying animals should investigate 'the distribution and content of conscious awareness–subjective emotions, desires, beliefs, and behavioral choices intended to achieve certain results or avoid others' states Griffin (p. 23). In promoting these goals, he criticizes 'inclusive behaviorists'–those scientists who study mental representations, information processing, communication, or any other aspect of modern animal behavior–but remain either agnostic towards, or in many examples cited, opposed to, the existence of subjective conscious states in nonhuman animals. Griffin does not denigrate the work of such scientists; in fact he cites the work as supporting the existence of consciousness in nonhuman animals. But he does argue that inclusive behaviorists are unjustifiably inhibited by a taboo against making inferences about consciousness, and that if this taboo were ignored our science would progress more rapidly. Some readers might rather argue the reverse: that a preoccupation with the private *subjective* states of nonhuman animals, states often thought undetectable, is a distraction from the real business of science. That business, it can be argued, is to carefully document the *objective*, publicly verifiable properties of behavior and to make inferences about the information-processing machinery necessary to account for behavior. This approach has been extremely productive and is well documented in Griffin's book.

Conspicuously, the causal contribution of consciousness to behavior is never stated. Griffin argues that it is premature to do so, given that we know so little about it. Instead of directly indicating what a conscious organism should be able to do that an unconscious one could not do, the statement that some behaviors are 'suggestive' of consciousness is frequently repeated. The reader can distil from these indirect references that Griffin believes that consciousness is at work when animals learn, when they communicate, and when they respond to changing conditions in flexible ways. In a representative example, Griffin contrasts the 'simpler and more parsimonious explanation…that the beaver thinks consciously in simple terms about its situation, and how its behavior may produce desired changes in its environment' with a 'genetically determined program [that] requires that we postulate special subprograms to cover numerous special situations' (p. 112). This and other similar comparisons are false dichotomies that misrepresent mainstream interest in how information is represented and processed in animals' brains, with or without consciousness. Modern inclusive behaviorists posit the existence of mental representations of past experiences, of conspecifics, of food and predators, and argue that these mental representations are subject to various kinds of manipulations that give flexibility to behavior. It may not be clear how Griffin's invocation of consciousness simplifies an account of the information processing necessary to account for behavior.

Griffin rightly discusses the ethical implications of the status of consciousness in nonhuman animals. Even if it is the case that we can find no scientific method for detecting consciousness, even if it were